ICORE Development Award

Incorporating the Sciences of Emerging Pathogens in High School Curricula

Grant Title: ***Warm Waters,Harsh Consequences:The Relationship Between Pathogens, Oysters, and Global Warming***

Principal Instructor: Jill Stephens, North Marion High School Science Instructor
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Abstract:
AICE Environmental Management + Biotechnology students will partner with researchers from the University of Florida and representatives from the oyster industry in Florida to monitor levels of pathogens found in oysters and the temperatures of the water at time of harvest. Data will be collected from oysters harvested in Apalachicola, Cedar Key, and Horseshoe Beach waters. Protein analysis and other testing will be conducted to detect potential presence of pathogens. Students will assist in quantifying test results. The type and degree of pathogens will be recorded for each specimen sample. The analysis of data will include a comparison of the levels of pathogens at each site with the temperature of the water at time of harvest to determine the potential effects of global warming on the levels of pathogens in the coastal waters of Florida. Additional testing may include water and sediment samples. Field trips to UF and harvest areas will occur.

Mission Statement:
Participants will collaborate to collect data describing the relationship between water temperature and levels of pathogens in oysters to demonstrate the potential effects of global warming on pathogen levels in coastal waters and shellfish.

Description of Teaching Module/Outcomes:
Objectives: Students will conduct literature reviews & report findings to the class.

- Students will use the scientific method to study the effects of global warming on pathogens in the coastal waters of Florida.
- Students will collect and record data.
- Students will demonstrate the ability to collect and process aquatic specimens.
- Students will conduct PAGE testing.
- Students will conduct appropriate assays.
- Students will quantify the amount and types of pathogens present in samples.
- Students will compare temperature to pathogen levels.
- Students will demonstrate PCR techniques.
- Students will analyze data to determine potential consequences of global to coastal waters.

Materials: (for a class of 30)
Gloves
Safety Glasses
Balance

Permanent markers
3M Biofilm
Petri dishes
LB broth
Agar
PAGE equipment and buffers
ELISA reagents and related materials
Micropipets
Pipet tips
Autoclave
dH2O
Test tubes (9 mL)
Thermocycler
PCR tubes and buffers
Markers and controls for all tests
Blender
Salt water Aquarium
Oysters for classroom aquarium
Non-pathogenic bacteria for inoculation of classroom oysters
Thermometers
Collection bags/buckets
Coolers and Ice for collection
Oyster specimens from each sampling location

Action Steps:

1. Conduct a literature review.
2. Receive approval of the project from the school administration and county science coordinator.
3. Enlist assistance of UF personnel and resources.
4. Contact Commissioner Bronson of the Florida Department of Agriculture and representatives from the oyster industry.
5. Prepare lessons for the project module.
6. Establish testing protocols in collaboration with University of Florida personnel.
7. Establish a classroom model ecosystem.
8. Collect specimens monthly from the sampling locations beginning in August or September.
9. Send the samples to UF partners for testing. (Students will have the opportunity to observe/participate in testing at UF during the course of the research project.)
10. Inoculate classroom oysters with non-pathogenic bacteria.
11. Harvest the oysters at regular intervals and at varying temperatures.
12. Test for levels of the non-pathogenic bacteria.
13. Record all data.
14. Compare the bacteria levels of the classroom model to the harvest temperature.
15. Compare classroom data to the data collected from the sample sites.
16. Draw conclusions and submit a report in May.
17. Repeat testing & sampling for up to 5 years.

Principal Instructor Background:

Education:

- BS: Agriculture and Extension Education from the University of Florida 1980
- Master of Agriculture: Agriculture and Extension Education from the University of Florida 1987
- Biotechnology training through CPET June 2005 and June 2006
- Biotechnology training through UF Center of Excellence for Health and Regenerative Biotechnology July 2007, June 2008, and July 2008
- ICORE *Emerging Pathogens* June 2008

Certifications:

- National Board Certified Teacher 2000 Career and Technology Education
- Florida Professional Teaching Certificate expires 2011 *Agriculture and Natural Resources* and *Biology*
- Industrial Biotechnology certified for Marion County, Florida

Teaching Experience:

1980-1994 Agriscience Instructor at Forest High School Ocala, Florida
1994-2005 Agriscience Instructor at North Marion High School Citra, Florida
2005-2008 Instructor of *Integrated Science, Integrated Science for Biotechnology, Genetics, Biotechnology I* North Marion High School

Awards, Honors, and Presentations

- Teacher of the Year Forest High School 1988, North Marion High School 2004
- Member of the group to write the Florida state standards and curriculum for *Biotechnology I, Biotechnology II, and Biotechnology III* 2006
- Biotechnology Presenter at FAST conference October 2007
- Accepted as co-presenter at 2008 NSTA conference October 2008
- Grants for Great Ideas recipient (Marion County Public Education Foundation)
  - 2006-2007 *It isn't Rocket Science* $1000
  - 2007-2008 *Nature's Cleaning Machine* $1000
  - 2007-2008 *Science under the Stars* $1000
- School Advisory Mini-Grants
  - 2005-2006 Science Quest $1200
  - 2006-2007 CSI Night $500
- National Science Foundation Grant in partnership with the University of Florida, Santa Fe Community College and Santa Fe High School

Literature cited:

Masters thesis by S. Manley

Budget Items:

Travel
5 PAGE boxes
PAGE buffers
Aquarium and pump
Artificial Sea Water
Micropipet tips
9 mL test tubes

Electronic Balance
PCR buffers
Blender
Bacteria
Gloves
Agar
Petri dishes
Benchtop Autoclave
ELISA reagents
ELISA plates
Sample bottles
3M Biofilm
Printing
digital cameras

Additional funding sources to be explored:

Marion County Public Education Foundation
NMHS School Advisory Committee
B.E.E.F.
Toyota Tapestry Grant
Sams Club
Walmart
FL. Dept of Agriculture
NSF

Unit: Warm Waters, Harsh Consequences….
Lesson 1
Setting up a Model Aquarium for Oyster Culture and Inoculation

(This lesson will be carried over the weekend and occur on two days.)

Materials: Handout(excerpt from UF thesis by Milan Srivastavia),
18 gallons Artificial Sea Water, 25 gallon aquarium or tank, 5 filter pumps, 30 oysters, 5 five gallon aquariums/tanks, non-pathogenic bacteria

*Note: Oysters should be used w/in 24hrs post harvest

Introduction: Students will review the purpose for setting up the model aquarium and background information from the handout. (15-20 minutes)

Activity:

1. Students will clean the tank with Alconox solution and rinse with tap water. (Friday)
2. Students will rinse the tank with ASW.
3. Fill the 25 gallon tank with 8 gallons of ASW.
4. Place 2 filter pumps in the tank.
5. Place the oysters in the tank with the room temperature ASW.
6. Acclimate the oysters in the large tank for 72 hours.
7. Clean and rinse the smaller tanks in preparation for moving and inoculation of the oysters on Monday.
8. Place a filter pump in each of the five smaller tanks.
9. Add 2 gallons of ASW to each 5 gallon tank.
10. Place 6 of the acclimated oysters into each tank.
11. Inoculate 3 of the tanks with $10^{\wedge 6}$ CFU/ml of the bacteria.
12. Students will test the oysters in the next lesson to determine presence of the bacteria in the oysters.